

REMARKS

I. Summary of Office Action and Examiner Interview

Rejection of claims 55, 57-59, 70, 81, and 93 were withdrawn.

Claims 54-56 and 89 remain rejected under 35 U.S.C. §112, first paragraph.

Claim 56 remain rejected under 35 U.S.C. §112, second paragraph.

Claims 51, 91, and 122 remain rejected on the ground of nonstatutory obviousness-type double patenting over claim 1 of U.S. Patent No. 5,985,232 (hereinafter "Howard '232").

Claims 51, 91, and 122 remain rejected under 35 U.S.C. §102(b) over Howard '232.

Claims 51-55, 59-92, and 122 remain rejected under 35 U.S.C. §103(a) over Howard '232 in view of Applicants' alleged admissions.

Claims 57, 58, 66, and 67 remain rejected under 35 U.S.C. §103(a) over Howard '232 in view of Grieco et al. "Fullerene carbon in combustion-generated soot," 38 Carbon 596 (2000) (hereinafter "Grieco et al.").

Applicant thank Examiner McCracken for the helpful and courteous discussion held with the Applicants' representatives on November 29, 2007. Proposed amendments to the claims and differences between the cited references were discussed, as more fully explained below.

II. Amendments to the Claims

Claims 123 is added. Claims 1, 16, 18, 20, 22, 23, 28, 29, 46, 48, 49, 51, 61, 62, 69, 73-75, 78, 81, 84-88, 91, 92, 120, and 120 are currently amended. Support can be found throughout the specification. For example, support can be found at page 19, line 5-8, page 21, line 15 through page 23, line 7 and at Figure 2.

Claims 4-6, 54-56, 60, 68, 89, and 93-119 are canceled.

II. 35 U.S.C. §112, Second Paragraph Rejection

Applicants thank Examiner McCracken for indicating that the amendments to claims 55, 57-59, 70, and 81 obviate 35 U.S.C. §112, second paragraph rejection. Applicants submit that cancellation of claim 56 also obviates the 35 U.S.C. §112, second paragraph rejection.

III. 35 U.S.C. §112, First Paragraph Rejection

Claims 54-56 and 89 were rejected under 35 U.S.C. §112, first paragraph as allegedly failing to comply with the enablement requirement. Although Applicants disagree, Applicants have canceled these claims to expedite prosecution. Applicants respectfully request withdrawal of the rejection.

VI. Nonstatutory Double Patenting and 35 U.S.C. §§ 102, 103 Rejections

Prior to the claimed invention, “[t]he procedures most commonly used for purifying fullerenes employ[ed] significant amounts of organic solvent. The solvents [were] used to first extract a fullerene mixture from insoluble soot and other insoluble condensed materials and then [were] used to purify and separate the individual fullerenes. Typically, the different constituents of the condensed matter [were] collected by filtration or some other technique, and the soluble components [were] extracted by a high energy-input extraction process such as sonication or soxhlet extraction using an organic solvent such as toluene.” (Page 2, lines 8-17 of the specification).

However, the “methods described above [had] a number of drawbacks. Organic solvents are expensive and must be disposed of as hazardous waste. . . . Furthermore, handling of the condensed matter for the separation stages can become difficult at larger scales due to the very small particle size of the soot particles (typically in the micron (μm) size range or less), and separation of liquid-borne soot particles is difficult and inefficient for particles in this size range.” (page 2, line 18 through page 3, line 2 of the specification).

Furthermore, such separation of fullerenes were carried out because “it [was] not known whether fullerenes are formed in the condensed phase and so exist embedded in the solid

particles, or whether they are formed in the gas phase and subsequently consumed by and/or embedded within the soot particles or agglomerates.” (Page 4, lines 20-22 of the specification).

Howard ‘232 also teaches separation and purification of the fullerenes that are consistent with the conventional methods. For example, Howard ‘232 states that “[c]onventional collection techniques such as bag filtration, electrostatic separation and cyclone separation are also within the scope of the invention.” (col. 7, lines 62-65; see also col. 7, lines 41-65). Then, Howard ‘232 describes the subsequent separation of the fullerenes from soot by, for example, soxhlet extraction (see col. 8, lines 7-30). However, Howard ‘232 does not teach or suggest separating gaseous fullerenes from solid soot using a filter as claimed in the independent claims.

In other words, it was not well-understood at the time of the effective date of Howard ‘232 (or as recently as the filing of the above-identified application) whether fullerenes exist in the gaseous form or in the solid formed embedded in or on the soot particles. The definition of “condensibles” provided by Howard ‘232 only mentions fullerenes in the particle form (“particles formed within the flame or during the collection process, such as soot or fullerene structures” (col. 3, lines 46-48). Although Howard ‘232 recognizes that “[c]ondensibles may include vapors which are collected as they exit the flame” (col. 3, lines 49-50), Howard ‘232 does not identify fullerenes in the vapor and that there are numerous other materials, such PAH, uncombusted fuel, etc., that typically form or exist in the vapor phase during, for example, combustion. Moreover, *en arguendo*, even if it was known that fullerenes can form in the gaseous phase, it was not known whether such gaseous fullerenes could be sufficiently long lived (e.g., without adsorbing and nucleating onto the soot particles or condensing to the solid state) to allow separation of gaseous fullerenes from particulate soot utilizing a filter. Therefore, it would not have been obvious to one of ordinary skill in the art that separation of gaseous fullerenes from solids can be performed from the teachings of Howard ‘232.

Applicants further note that Howard ‘232 teaches the use of “bag filtration” (col. 7, lines 62-65) as one exemplary method for collecting solid fullerenes and soot. In light of such teaching, Applicant submit that Howard ‘232 in fact teaches away from the claims as one of ordinary skill in the art would have expected that using a filter would lead to collecting “samples of [solid] soot and condensibles . . . at a given ‘post-flame’ distance from the burner” (col. 7,

lines 41-42) rather than collecting only the solid soot particles and separating out the gaseous fullerenes.

Applicants further note that the claimed invention solves a need long-felt by the community. Until the inventors have conceived of the claimed invention, conventional techniques for separating fullerenes from soot required expensive and time-consuming techniques. Given that discovery of fullerenes occurred in 1985, more than 15 years have elapsed where one of ordinary skill in the art were utilizing undesirably expensive and complex fullerene separation techniques (i.e. separating fullerenes from soot) to obtain purified fullerenes. Applicant submit that the claimed invention solves a long-felt need in the community to obtain purified fullerenes in a simpler, cheaper, and more robust manner, thereby further affording superior results previously unachieved.

Grieco et al. does not remedy the deficiencies described above. Grieco et al. also teaches collecting soot, PAH, and fullerenes in the form of *solids* (see page 599, first full paragraph of Grieco et al.) and does not teach or suggest separating suspended soot particles from a gas stream which contains gaseous fullerenes, either alone or in combination with Howard '232.

Accordingly, Applicants submit that independent claims 51, 91, and 122 are allowable for at least the reasons stated above. Applicants submit that claims which directly or indirectly depend on independent claims 51 or 91 are also allowable for at least the reasons stated above. Reconsideration and withdrawal of the rejections is respectfully requested.

Applicants further submit that, for at least the reasons stated above, the obviousness-type double patenting rejection is overcome as claims 51, 91, and 122 are directed to patentably distinct subject matter as compared to claim 1 of the Howard '232. Reconsideration and withdrawal of the rejections is respectfully requested.

Lastly, as generic claim 122 is allowable, Applicants request the Examiner to also consider claims that have been withdrawn from consideration. Upon consideration of these claims, Applicants submit that the withdrawn claims are also allowable for at least the reasons stated above.

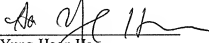
VIII. Conclusion

Applicants are submitting herewith a petition for an extension of time with the payment of the requisite fees. As such, this response is being timely filed. In the event that additional extensions of time are required, the Commissioner is requested to grant a petition for that extension of time, which is required to make this response timely. The Commissioner is hereby authorized to charge any additional fees or credit any overpayment to Deposit Account No. 08-0219.

In view of the above amendment and remarks, Applicants believe the pending application is now in condition for allowance. Early notification of such is earnestly solicited.

Respectfully submitted,

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